

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Patent Number: 7,268,503  
Issued: September 11, 2007  
Name of Patentee: Yamasaki et al.  
Title of Invention: VIBRATION LINEAR ACTUATING DEVICE, METHOD OF DRIVING THE SAME  
DEVICE, AND PORTABLE INFORMATION APPARATUS USING THE SAME  
DEVICE

**REQUEST FOR CERTIFICATE OF CORRECTION OF PATENT**  
**FOR PTO MISTAKE (37 C.F.R. § 1.322(a))**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Attention: Decision and Certificate of Correction  
Branch of the Patent Issue Division

1. Attached is Form PTO/SB/44 being suitable for printing.
2. Correction of the Official Letters Patent is respectfully requested in view of the following text which appears correctly in the application file:

Please replace claim 1 with the following:

1. A vibration linear actuating device comprising a vibrating linear actuator and a driver for driving the actuator;  
the vibrating linear actuator including:
  - (a) a mover having a permanent magnet magnetized in a radial direction
  - (b) a stator having a coil and facing the permanent magnet; and
  - (c) an elastic body for coupling the stator to the mover and energizing the mover toward a center of the stator, the driver including:
    - (d) a driving section having a switching element for powering the coil;
    - (e) and output controller for controlling the switching element; and
    - (f) a zero-cross detector for detecting a zero-cross point of back electromotive force (BEMF) generated in the coil and outputting a zero-cross signal;

wherein the driver transmits the zero-cross signal to the output controller and powers the coil in one direction for vibrating the mover in corporation with the elastic body,

characterized by

  - (g) a zero-cross monitor interposed between the zero-cross detector and the output controller, the zero-cross monitor monitoring the zero-cross signal and prohibiting acceptance of a next zero-cross signal for a given time after input of the zero-cross signal.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 2 with the following:

2. The vibration linear actuating device of claim 1, wherein the driver transmits a re-starter signal to the output controller when the zero-cross signal is halted for a given time.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 3 with the following:

3. The vibration linear actuating device of claim 1, wherein the zero-cross detector is coupled to the coil via a BEMF amplifier and a level-shift section.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 4 with the following:

4. The vibration linear actuating device of claim 1, wherein the driver further includes a timing adjuster disposed between the zero-cross detector and the output controller.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 5 with the following:

5. The vibration linear actuating device of claim 4, wherein the timing adjuster includes a phase locked loop.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 6 with the following:

6. The vibration linear actuating device of claim 1, wherein the output controller includes a pulse width modulator.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 7 with the following:

7. A method of driving a vibrating linear actuator, the actuator comprising: a mover having a permanent magnet magnetized in a radial direction; a stator having a coil and facing the permanent magnet; and an elastic body for coupling the stator to the mover and energizing the mover toward a center of the stator, the method comprising the steps of:

- (a) determining a zero-cross point of back electromotive force generated in the coil;
- (b) determining a period for powering the coil in every cycle;
- (c) determining a period for powering the coil at starting time;
- (d) counting step (b) based on the determined result of step (a);
- characterized by the additional step of
- (e) starting to count depending on the judging result at step (a),

wherein the judging result at step (a) is kept invalidated until counting up at step (e).

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 8 with the following:

8. The method of driving a vibrating linear actuator of claim 7 further comprising step (f) for counting for itself based on the determined result of step (a), wherein step (c) starts counting when step (f) counts up.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 9 with the following:

9. The method of driving a vibrating linear actuator of claim 8, wherein step (f) is reset depending on a next determined result.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 10 with the following:

10. A portable information apparatus comprising:  
(a) a board;  
(b) a vibrating linear actuator mounted to the board; the actuator including:  
(b-1) a mover having a permanent magnet magnetized in a radial direction;  
(b-2) a stator having a coil and facing the permanent magnet; and  
(b-3) an elastic body for coupling the stator to the mover and energizing the mover toward a center of the stator;  
(c) a driver mounted to the board, the driver including:  
(c-1) a driving section having a switching element for powering the coil;  
(c-2) an output controller for controlling the switching element; and  
(c-3) a zero-cross detector for detecting a zero-cross point of back electromotive force (BEMF) generated in the coil and outputting a zero-cross signal;  
wherein the driver transmits the zero-cross signal to the output controller and powers the coil in one direction for vibrating the mover in corporation with the elastic body, characterized by  
(c-4) a zero-cross monitor interposed between the zero-cross detector and the output controller,  
the zero-cross monitor monitoring the zero-cross signal and prohibiting acceptance of a next zero-cross signal for a given time after input of the zero-cross signal.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 11 with the following:

11. The portable information apparatus of claim 10, wherein the vibrating linear actuator generates vibrations with a maximum amplitude in a vertical direction to the board.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 12 with the following:

12. The portable information apparatus of claim 10, wherein the driver transmits a re-starter signal to the output controller when the zero-cross signal is halted for a given time.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 13 with the following:

13. The portable information apparatus of claim 10, wherein the zero-cross detector is coupled to the coil via a BEMF ampler and a level-shift section.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 14 with the following:

14. The portable information apparatus of claim 10, wherein the driver further includes a timing adjuster disposed between the zero-cross detector and the output controller.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 15 with the following:

15. The portable information apparatus of claim 14, wherein the timing adjuster includes a phase locked loop.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please replace claim 16 with the following:

16. The portable information apparatus of claim 10, wherein the output controller includes a pulse width modulator.

As indicated in the Article 34 Amendment filed on September 27, 2004.

Please cancel claims 17-21 from the originally filed application.

3. Please send the Certificate to:

Name: Lawrence E. Ashery  
P.O. Box 980  
Valley Forge, PA 19482  
(610) 407-0700

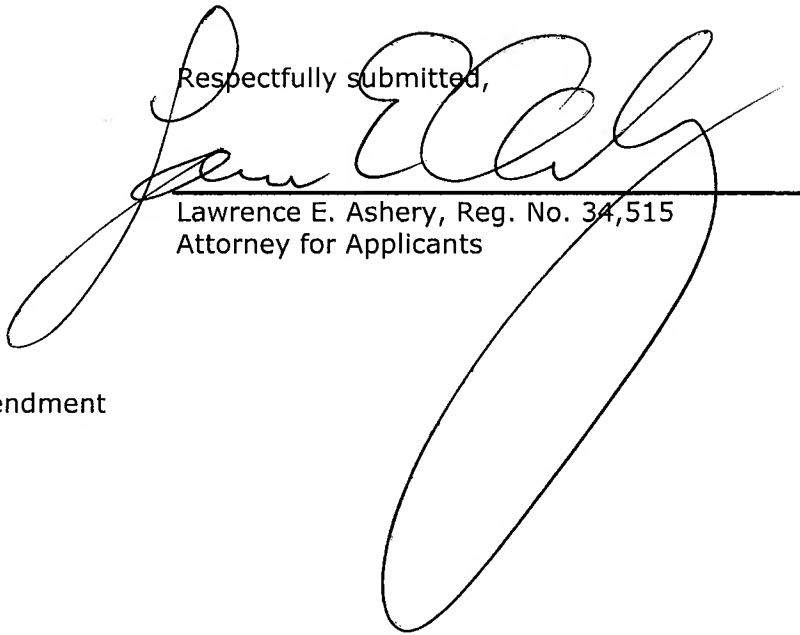
Name of Assignee: Panasonic Corporation

Assignment Recorded on: September 27, 2004

Reel: 016443

Frame: 0393

Respectfully submitted,



Lawrence E. Ashery, Reg. No. 34,515  
Attorney for Applicants

LEA/nm

Enclosure: Form PTO/SB/44  
Copy of Article 34 Amendment

Dated: January 11, 2010

P.O. Box 980  
Valley Forge, PA 19482  
(610) 407-0700

NM556437

**UNITED STATES PATENT AND TRADEMARK OFFICE  
CERTIFICATE OF CORRECTION**

PATENT NO: 7,268,503  
APPLICATION NO.: 10/508,992  
ISSUED: SEPTEMBER 11, 2007  
INVENTOR(S): HIROKAZU YAMASAKI AND KOJI KAMEDA

Page 1 of 7

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please replace claim 1 with the following:

1. A vibration linear actuating device comprising a vibrating linear actuator and a driver for driving the actuator; the vibrating linear actuator including:
  - (a) a mover having a permanent magnet magnetized in a radial direction
  - (b) a stator having a coil and facing the permanent magnet; and
  - (c) an elastic body for coupling the stator to the mover and energizing the mover toward a center of the stator, the driver including:
    - (d) a driving section having a switching element for powering the coil;
    - (e) and output controller for controlling the switching element; and
    - (f) a zero-cross detector for detecting a zero-cross point of back electromotive force (BEMF) generated in the coil and outputting a zero-cross signal;wherein the driver transmits the zero-cross signal to the output controller and powers the coil in one direction for vibrating the mover in corporation with the elastic body, characterized by
  - (g) a zero-cross monitor interposed between the zero-cross detector and the output controller, the zero-cross monitor monitoring the zero-cross signal and prohibiting acceptance of a next zero-cross signal for a given time after input of the zero-cross signal.

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This collection of information is required by 37 CFR 1.322, 1.323 and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Page 2 of 7

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Please replace claim 2 with the following:

2. The vibration linear actuating device of claim 1, wherein the driver transmits a re-starter signal to the output controller when the zero-cross signal is halted for a given time.

Please replace claim 3 with the following:

3. The vibration linear actuating device of claim 1, wherein the zero-cross detector is coupled to the coil via a BEMF amplifier and a level-shift section.

Please replace claim 4 with the following:

4. The vibration linear actuating device of claim 1, wherein the driver further includes a timing adjuster disposed between the zero-cross detector and the output controller.

Please replace claim 5 with the following:

5. The vibration linear actuating device of claim 4. wherein the timing adjuster includes a phase locked loop.

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Page 3 of 7

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please replace claim 6 with the following:

6. The vibration linear actuating device of claim 1, wherein the output controller includes a pulse width modulator.

Please replace claim 7 with the following:

7. A method of driving a vibrating linear actuator, the actuator comprising:  
a mover having a permanent magnet magnetized in a radial direction;  
a stator having a coil and facing the permanent magnet; and  
an elastic body for coupling the stator to the mover and energizing the mover toward a center of the stator, the method comprising the steps of:  
(a) determining a zero-cross point of back electromotive force generated in the coil;  
(b) determining a period for powering the coil in every cycle;  
(c) determining a period for powering the coil at starting time;  
(d) counting step (b) based on the determined result of step (a); characterized by the additional step of  
(e) starting to count depending on the judging result at step (a), wherein the judging result at step (a) is kept invalidated until counting up at step (e).

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please replace claim 8 with the following:

8. The method of driving a vibrating linear actuator of claim 7 further comprising step (f) for counting for itself based on the determined result of step (a), wherein step (c) starts counting when step (f) counts up.

Please replace claim 9 with the following:

9. The method of driving a vibrating linear actuator of claim 8, wherein step (f) is reset depending on a next determined result.

Please replace claim 10 with the following:

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Page 5 of 7

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please replace claim 10 with the following:

10. A portable information apparatus comprising:  
(a) a board;  
(b) a vibrating linear actuator mounted to the board; the actuator including:  
(b-1) a mover having a permanent magnet magnetized in a radial direction;  
(b-2) a stator having a coil and facing the permanent magnet; and  
(b-3) an elastic body for coupling the stator to the mover and energizing the mover toward a center of the stator;  
(c) a driver mounted to the board, the driver including:  
(c-1) a driving section having a switching element for powering the coil;  
(c-2) an output controller for controlling the switching element; and  
(c-3) a zero-cross detector for detecting a zero-cross point of back electromotive force (BEMF) generated in the coil and outputting a zero-cross signal;  
wherein the driver transmits the zero-cross signal to the output controller and powers the coil in one direction for vibrating the mover in corporation with the elastic body,  
characterized by  
(c-4) a zero-cross monitor interposed between the zero-cross detector and the output controller,  
the zero-cross monitor monitoring the zero-cross signal and prohibiting acceptance of a next zero-cross signal for a given time after input of the zero-cross signal.

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Page 6 of 7

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please replace claim 11 with the following:

11. The portable information apparatus of claim 10, wherein the vibrating linear actuator generates vibrations with a maximum amplitude in a vertical direction to the board.

Please replace claim 12 with the following:

12. The portable information apparatus of claim 10, wherein the driver transmits a re-starter signal to the output controller when the zero-cross signal is halted for a given time.

Please replace claim 13 with the following:

13. The portable information apparatus of claim 10, wherein the zero-cross detector is coupled to the coil via a BEMF ampler and a level-shift section.

Please replace claim 14 with the following:

14. The portable information apparatus of claim 10, wherein the driver further includes a timing adjuster disposed between the zero-cross detector and the output controller.

Please replace claim 15 with the following:

15. The portable information apparatus of claim 14, wherein the timing adjuster includes a phase locked loop.

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PATENT NO: 7,268,503

Page 7 of 7

APPLICATION NO.: 10/508,992

ISSUED: SEPTEMBER 11, 2007

INVENTOR(S): HIROKAZU YAMASAKI AND KOJI KAMEDA

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Please replace claim 16 with the following:

16. The portable information apparatus of claim 10, wherein the output controller includes a pulse width modulator.

Cancel claims 17-21.

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International Patent Application PCT/JP03/04200

Applicant: MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD. et al

Our ref: PCT1953DK101cn

Date: March 18, 2004

## CLAIMS

1. A vibration linear actuating device comprising a vibrating linear actuator and a driver for driving the actuator;

the vibrating linear actuator including:

- (a) a mover having a permanent magnet magnetized in a radial direction
- (b) a stator having a coil and facing the permanent magnet; and
- (c) an elastic body for coupling the stator to the mover and energizing the mover toward a center of the stator, the driver including:
- (d) a driving section having a switching element for powering the coil;
- (e) and output controller for controlling the switching element; and
- (f) a zero-cross detector for detecting a zero-cross point of back electromotive force (BEMF) generated in the coil and outputting a zero-cross signal;

wherein the driver transmits the zero-cross signal to the output controller and powers the coil in one direction for vibrating the mover in corporation with the elastic body,

characterised by

- (g) a zero-cross monitor interposed between the zero-cross detector and the output controller, the zero-cross monitor monitoring the zero-cross signal and prohibiting acceptance of a next zero-cross signal for a given time after input of the zero-cross signal.

2. The vibration linear actuating device of claim 1, wherein the driver transmits a re-starter signal to the output controller when the zero-cross signal is halted for a given time.
3. The vibration linear actuating device of claim 1, wherein the zero-cross detector is coupled to the coil via a BEMF amplifier and a level-shift section.
4. The vibration linear actuating device of claim 1, wherein the driver further includes a timing adjuster disposed between the zero-cross detector and the output controller.
5. The vibration linear actuating device of claim 4, wherein the timing adjuster includes a phase locked loop.
6. The vibration linear actuating device of claim 1, wherein the output controller includes a pulse width modulator.
7. A method of driving a vibrating linear actuator, the actuator comprising:
  - a mover having a permanent magnet magnetized in a radial direction;
  - a stator having a coil and facing the permanent magnet; and
  - an elastic body for coupling the stator to the mover and energizing the mover toward a center of the stator, the method comprising the steps of:
    - (a) determining a zero-cross point of back electromotive force generated in the coil;
    - (b) determining a period for powering the coil in every cycle;
    - (c) determining a period for powering the coil at starting time;
    - (d) counting step (b) based on the determined result of step (a);**characterised by the additional step of:**
    - (e) starting to count depending on the judging result at step (a),wherein the judging result at step (a) is kept invalidated until counting up at step (e).

8. The method of driving a vibrating linear actuator of claim 7 further comprising step (f) for counting for itself based on the determined result of step (a), wherein step (c) starts counting when step (f) counts up.
9. The method of driving a vibrating linear actuator of claim 8, wherein step (f) is reset depending on a next determined result.
10. A portable information apparatus comprising:
  - (a) a board;
  - (b) a vibrating linear actuator mounted to the board; the actuator including:
    - (b-1) a mover having a permanent magnet magnetized in a radial direction;
    - (b-2) a stator having a coil and facing the permanent magnet; and
    - (b-3) an elastic body for coupling the stator to the mover and energizing the mover toward a center of the stator;
  - (c) a driver mounted to the board, the driver including:
    - (c-1) a driving section having a switching element for powering the coil;
    - (c-2) an output controller for controlling the switching element; and
    - (c-3) a zero-cross detector for detecting a zero-cross point of back electromotive force (BEMF) generated in the coil and outputting a zero-cross signal;

wherein the driver transmits the zero-cross signal to the output controller and powers the coil in one direction for vibrating the mover in corporation with the elastic body,

characterised by

- (c-4) a zero-cross monitor interposed between the zero-cross detector and the output controller,

**COPY**

the zero-cross monitor monitoring the zero-cross signal and prohibiting acceptance of a next zero-cross signal for a given time after input of the zero-cross signal.

11. The portable information apparatus of claim 10, wherein the vibrating linear actuator generates vibrations with a maximum amplitude in a vertical direction to the board.
12. The portable information apparatus of claim 10, wherein the driver transmits a re-starter signal to the output controller when the zero-cross signal is halted for a given time.
13. The portable information apparatus of claim 10, wherein the zero-cross detector is coupled to the coil via a BEMF amplifier and a level-shift section.
14. The portable information apparatus of claim 10, wherein the driver further includes a timing adjuster disposed between the zero-cross detector and the output controller.
15. The portable information apparatus of claim 14, wherein the timing adjuster includes a phase locked loop.
16. The portable information apparatus of claim 10, wherein the output controller includes a pulse width modulator.

**COPY**



5/13

FIG. 7

